WHAT IS CLAIMED IS:

1. A computer-implemented method for use in creating a plan to reposition a patient's teeth from a set of initial tooth positions to a set of final tooth positions, the method comprising:

receiving an initial digital data set representing the teeth at the initial positions;

receiving one or more constraints associated with the repositioning of the teeh; and

generating treatment paths to move the teeth from the initial positions to the final positions in accordance with the constraints.

2. The method of claim 1, wherein one of the constraints relates to teeth crowding.

3. The method of claim 1, wherein one of the constraints relates to teeth spacing.

4. The method of claim 1, wherein one of the constraints relates to teeth extraction.

5. The method of claim 1, wherein one of the constraints relates to teeth stripping.

6. The method of claim 1, wherein one of the constraints relates to teeth rotation.

7. The method of claim 6, wherein the teeth is rotated approximately five and ten degrees (per stage).

8. The method of claim 1, wherein one of the constraints relates to teeth movement.

9. The method of claim 8, wherein the teeth is incrementally moved in one or more stages (per stage).

10. The method of claim 9, wherein each tooth is moved approximately 0.2mm to approximately 0.4mm in each stage.

11. The method of claim 9, wherein the constraints are stored in an array.

12. The method of claim 10 wherein one dimension of the array identifies each stage in the teeth movement.

13. The method of claim 1, wherein generating the treatment paths includes determining the minimum amount of transformation required to move each tooth from the initial position to the final position and creating each treatment path to require only the minimum amount of movement.

14. The method of claim 1, wherein generating the treatment path includes generating intermediate positions for at least one tooth between which the tooth undergoes translational movements of equal sizes.

15. The method of claim 1, wherein generating the treatment path includes generating intermediate positions for at least one tooth between which the tooth undergoes translational movements of unequal sizes.

16. The method of claim 1, further comprising applying a set of rules to detect any collisions that will occur as the patient's teeth move along the treatment paths.

17. The method of claim 16, wherein detecting collisions comprises calculating distances between a first tooth and a second tooth by:

establishing a neutral projection plane between the first tooth and the second tooth,

establishing a z-axis that is normal to the plane and that has a positive direction and a negative direction from each of a set of base points on the projection plane,

computing a pair of signed distances comprising a first signed distance to the first tooth and a second signed distance to the second tooth, the signed distances being measured on a line through the base points and parallel to the z-axis, and

determining that a collision occurs if any of the pair of signed distances indicates a collision.

18. The method of claim 17, wherein the positive direction for the first distance is opposite the positive direction for the second distance and a collision is detected if the sum of any pair of signed distances is less than or equal to zero.

19. The method of claim 1, further comprising receiving information indicating whether the patient's teeth are following the treatment paths and, if not, using the information to revise the treatment paths.

20. The method of claim 1, wherein generating treatment paths comprises generating more than one candidate treatment path for each tooth and providing a graphical display of each candidate treatment path to a human user for selection.

21. The method of claim 1, further comprising applying a set of rules to detect any collisions that will occur as the patient's teeth move along the treatment paths.

22. The method of claim 21, wherein detecting collisions comprises calculating distances between a first tooth and a second tooth by:

establishing a neutral projection plane between the first tooth and the second tooth,

establishing a z-axis that is normal to the plane and that has a positive direction and a negative direction from each of a set of base points on the projection plane,

computing a pair of signed distances comprising a first signed distance to the first tooth and a second signed distance to the second tooth, the signed distances being measured on a line through the base points and parallel to the z-axis, and

determining that a collision occurs if any of the pair of signed distances indicates a collision.

23. The method of claim 22, wherein the positive direction for the first distance is opposite the positive direction for the second distance and a collision is detected if the sum of any pair of signed distances is less than or equal to zero.

24. The method of claim 1, further comprising applying a set of rules to detect any improper bite occlusions that will occur as the patient's teeth move along the treatment paths.

25. The method of claim 24, further comprising calculating a value for a malocclusion index and displaying the value to a human user.

26. The method of claim 1, wherein generating the treatment paths includes receiving data indicating restraints on movement of the patient's teeth and applying the data to generate the treatment paths.

27. The method of claim 1, further comprising rendering a three-dimensional (3D) graphical representation of the teeth at the positions corresponding to a selected data set.

28. The method of claim 27, further comprising animating the graphical representation of the teeth to provide a visual display of the movement of the teeth along the treatment paths.

29. The method of claim 28, further comprising providing a graphical interface, with components representing the control buttons on a video cassette recorder, which a human user can manipulate to control the animation.

30. The method of claim 27, further comprising using only a portion of the data in the selected data set to render the graphical representation of the teeth.

31. The method of claim 27, further comprising applying level-of-detail compression to the data set to render the graphical representation of the teeth.

32. The method of claim 27, further comprising receiving an instruction from a human user to modify the graphical representation of the teeth and modifying the graphical representation in response to the instruction.

33. The method of claim 32, further comprising modifying the selected data set in response to the instruction from the user.

34. The method of claim 27, further comprising allowing a human user to select a tooth in the graphical representation and, in response, displaying information about the tooth.

35. The method of claim 34, wherein the information relates to the motion that the tooth will experience while moving along the treatment path.

36. The method of claim 34, wherein the information indicates a linear distance between the tooth and another tooth selected in the graphical representation.

37. The method of claim 27, wherein rendering the graphical representation comprises rendering the teeth at a selected one of multiple viewing orthodontic-specific viewing angles.

38. The method of claim 27, further comprising providing a user interface through which a human user can provide text-based comments after viewing the graphical representation of the patient's teeth.

39. The method of claim 27, wherein rendering the graphical representation comprises downloading data to a remote computer at which a human view wishes to view the graphical representation.

40. The method of claim 27, further comprising receiving an input signal from a 3D gyroscopic input device controlled by a human user and using the input signal to alter the orientation of the teeth in the graphical representation.

41. A computer-implemented system for use in creating a plan to reposition a patient's teeth from a set of initial tooth positions to a set of final tooth positions, comprising:

means for receiving an initial digital data set representing the teeth at the initial positions;

means for receiving one or more constraints associated with the repositioning of the teeh; and

means for generating treatment paths to move the teeth from the initial positions to the final positions in accordance with the constraints.

42. The system of claim 41, wherein one of the constraints relates to teeth crowding.

43. The system of claim 41, wherein one of the constraints relates to teeth spacing.

44. The system of claim 41, wherein one of the constraints relates to teeth extraction.

45. The system of claim 41, wherein one of the constraints relates to teeth stripping.

46. The system of claim 41, wherein one of the constraints relates to teeth rotation.

47. The system of claim 46, wherein the teeth is rotated approximately five and ten degrees (per stage).

48. The system of claim 41, wherein one of the constraints relates to teeth movement.

49. The system of claim 48, wherein the teeth is incrementally moved in one or more stages (per stage).

50. The system of claim 49, wherein each tooth is moved approximately 0.2mm to approximately 0.4mm in each stage.

51. The system of claim 49, wherein the constraints are stored in an array.

52. The system of claim 51 wherein one dimension of the array identifies each stage in the teeth movement.